Safe Work Practices and Responsibilities for Power Producers

Clean Energy BC

WorkSafeBC

A. Health and safety responsibilities

In most cases, the owner of a power system is also the employer.

Owner and employer responsibilities

- Ensure the health and safety of all workers at your worksite.
- Correct any hazardous conditions.
- Provide information to the employer or prime contractor as necessary to identify, eliminate, and control hazards.
- Inform workers about any remaining, known hazards.
- Ensure that workers know their rights and responsibilities.
- Make copies of the *Workers Compensation Act* and the Occupational Health and Safety Regulation available to workers.
- Ensure that workers comply with the Act, the Regulation, and any applicable orders.
- Establish an occupational health and safety program.
- Provide and maintain protective devices, equipment, and clothing. Ensure that workers use them.
- Ensure that workers receive education and training in the Workplace Hazardous Materials Information System (WHMIS).
- Ensure that workers are qualified to perform their work through education, supervision, and training specific to your operation.
- Meet emergency and first aid requirements, including training, certifications, equipment, transportation, and number of first aid attendants (if attendants are required).
- Consult and co-operate with your joint health and safety committee (or worker health and safety representative).
- Co-operate with WorkSafeBC and its officers.

Additional owner responsibilities

- Assign a person in charge (PIC).
- Grant the PIC exclusive authority to establish conditions for safe work and issue safety protection guarantees for the parts of the power system the PIC has authority over. This must be identified in your safe work procedures.
- Issue written assurances on a form acceptable to WorkSafeBC if the minimum limits of approach can't be maintained because of the circumstances of the work or the inadvertent movement of people or equipment.
- Authorize workers who may issue a safety protection guarantee or work on the power system.
- Ensure that qualified workers identify hazardous areas or conditions before pruning or falling trees close to energized high-voltage conductors.
- Develop and implement an emergency safety plan for incidents such as earthquakes, explosions, fires, hazardous material spills, power outages, and wildlife encounters.

1 Owner and employer

Person in charge (PIC)

Only one PIC at a time may be granted exclusive authority to establish conditions and issue safety protection guarantees for a power system. If the power system owner has granted authority, the PIC can authorize the start of work.

PIC responsibilities

- Establish the conditions for safe work and issue safety protection guarantees.
- Authorize work on the assigned part of the power system.
- Ensure that the part of the system being worked on is isolated, locked out, and grounded.
- Ensure that the status of the power system or assigned part is accurately represented on a mimic display.
- Maintain a log of switching details, safety protection guarantees, and operational events.
- Establish an effective communication system with the workers doing the work.

The PIC can only issue safety protection guarantees to qualified workers authorized by the owner. If a safety protection guarantee requires the use of isolation devices in different power systems, all of the PICs responsible must establish written procedures together and ensure they're followed.

Qualified workers

Employers must evaluate workers to determine if they're qualified to perform their assigned work safely (other than electrical work). Requirements to be considered a qualified electrical worker are specified in the *British Columbia Safety Standards Act* and the Electrical Safety Regulation.

For high-risk work, formal training programs are often designed to ensure workers have the education, training, jurisdictional certification, and experience to work safely, and to ensure qualifications are documented.

You may use the following elements to determine if workers are qualified for high-risk work:

- Learning and demonstration of new skills, verified by hands-on testing and on-the-job training.
- A period of close supervision or restricted work while workers gain experience in new skills and knowledge.
- A documented demonstration of competency, without help, to a qualified person. The qualified person should be a trainer specialized in the task or otherwise able to assess the worker's competency. A written assessment is required to prove the worker meets the minimum standard.

For low-risk work, competency checks may include only one of these elements. Low-risk checks sometimes rely on less-formal assessments by a supervisor while the worker is on the job. Documentation is still recommended.

2 Person in charge (PIC) — Qualified workers

Prime contractor (PC)

When two or more employers are working at the same location, health and safety activities must be coordinated. The power system owner can either coordinate activities or delegate that responsibility to a PC. According to sections 13 and 18 of the Act, a written agreement is required between the owner and the PC for the purposes of health and safety. Without such an agreement, the owner takes on the responsibilities of a PC.

PC responsibilities

- Communicate safety expectations to all contractors, subcontractors, and workers on the worksite.
- Explain the PC's authority in the workplace and relationship with the owner and subcontractors regarding safety issues.
- Coordinate and sequence work as it relates to safety.
- Manage the number of people on site.
- Ensure each employer provides the name of the person designated to supervise that employer's workers.
- Develop and implement procedures for visitor and site orientations.
- Provide a written assessment of high-risk situations, hazardous processes, and work scheduling.
- Coordinate safe delivery of equipment and materials.
- Ensure an emergency response plan is communicated to everyone on site.
- Establish and maintain first aid services, as required under section 3.16 of the Regulation.
- Ensure that hazard identification and risk control occur.

For more information, see the article *Prime Contractor Responsibilities,* available on **worksafebc.com**.

Supervisor

Larger operations typically have dedicated supervisors. In smaller operations, the supervisor may be one of the more experienced workers or even the owner.

Supervisors should have enough time to plan properly, before work starts. Supervisors also need a chance to discuss work plans with workers.

Supervisor responsibilities

- Ensure the health and safety of workers under your direct supervision.
- Develop and implement new plans as things change.
- Ensure that workers are told about any known hazards.
- Know the requirements of the Regulation that apply to the work being supervised.
- Consult and co-operate with the joint health and safety committee (or worker health and safety representative).
- Co-operate with WorkSafeBC and its officers.

3 Prime contractor (PC) — Supervisor

Workers play an important role in planning, particularly where decisions related to the worksite may affect them. Workers must be qualified to perform the tasks assigned to them.

Worker responsibilities

- Take care to protect your health and safety and that of others who may be affected by your actions.
- Comply with the Regulation and other legal requirements.
- Follow established safe work procedures.
- Use any required PPE.
- Operate equipment safely, according to the manufacturer's standards and instructions.
- Refrain from horseplay or similar conduct that may endanger others.
- Arrive fit for duty. Don't work if you're impaired for any reason (for example, from alcohol, drugs, or fatigue).
- Report all of the following to your supervisor or employer:
  - Accidents and incidents, including near misses
  - Hazards that might endanger others
  - A problem with protective equipment or clothing
- Co-operate with health and safety representatives, joint health and safety committees, and WorkSafeBC.

Refuse and report unsafe work

Workers have the right to refuse unsafe work. In fact, as a worker you must not carry out (or cause to be carried out)

any task you have reasonable cause to believe would put any person at risk.

If you discover an unsafe condition or believe you're expected to perform an unsafe act, you must report it immediately to your supervisor or employer. The supervisor or employer who receives the report must investigate the matter right away. Unsafe conditions must be corrected without delay.

The supervisor or employer may not agree the task is dangerous. If this is the case, sections 3.12 and 3.13 of the Regulation describe the steps to be followed.

Workers must not be disciplined for refusing to perform tasks they have reasonable cause to believe are dangerous. You may be assigned other work at no loss in pay while the unsafe condition is being investigated.

Formal OHS programs

Employers with 20 or more workers are required to have a formal occupational health and safety program. Formal programs consist of seven elements:

1. Occupational health and safety policy statement
2. Regular inspections
3. Written instructions for workers
4. Committee meetings to discuss health and safety issues
5. Investigations of incidents
6. Records and statistics
7. Instruction and supervision of workers

Less formal OHS programs

Employers with fewer than 20 workers require a less formal program based on regular monthly meetings with workers to discuss health and safety matters. You must do the following:

- Ensure that meetings focus on correcting unsafe conditions and practices, and making health and safety a priority in the workplace.
- Keep records of the meetings, who attended, and the topics discussed.

Regardless of the size of an operation, the basic duties specified in the Act and the Regulation still apply. Each contractor's site organization and procedures should support the PC's health and safety system, not replace it.

Note: A formal program may be required for operations with fewer than 20 workers if a WorkSafeBC officer deems it necessary.

5 Occupational health and safety programs

Orientations help ensure that health and safety guidelines are established before workers start at a new job or location. Health and safety training should be current, ongoing, and specific to the workplace. Provide instruction to workers whenever there are changes in the workplace, such as a new process or piece of equipment.

There are four basic steps to orientation and training:

1. Evaluate areas in which workers need training.
2. Train workers.
3. Test workers to ensure they understand the information.
4. Document, maintain, and update training records.

Orientation topics

An orientation should include the following:

- Provide workers with contact information for their supervisor.
- Explain workplace health and safety rules.
- Explain worker rights and responsibilities. This includes the right to refuse unsafe work and the responsibility to report unsafe conditions.
- Describe the locations of emergency equipment, how to raise an alarm, and worker responsibilities in an emergency.
- Tell workers about hazards they may encounter while performing assigned tasks (for example, confined spaces or arc flashes).
- Explain how to report potential hazards, unsafe conditions, and incidents — internally and to WorkSafeBC.
- Provide contact information for the joint health and safety committee (or worker health and safety representative).
- Train workers in relevant policies and procedures if they're assigned to work alone or in isolation.
- Define violence in the workplace and explain your workplace's policy regarding violence.
- Provide training on the use and care of required PPE and clothing, including manufacturers' specifications.
- Provide training in the Workplace Hazardous Materials Information System (WHMIS).
- Educate workers about the occupational health and safety program for your workplace.
- Encourage workers to ask questions if they're unsure of anything.

6 Site orientation and training

All workplaces must meet the first aid requirements in Part 3 of the Regulation. Your workplace must have a first aid kit on site. It may also require a designated first aid attendant and a suitable vehicle for the transportation of injured workers.

The type of kit and the need for a first aid attendant and transportation depends on three factors:

- The hazard rating for your operation
- The number of workers on site at any given time
- The travel time to the nearest hospital

To determine your first aid requirements, use the tables in Part 3 of the Regulation. First aid requirements are based on the number of workers per shift, so the requirements may vary for different shifts.

In the Regulation

- Sections 3.14 to 3.21, Occupational first aid
- Schedule 3-A, Minimum levels of first aid

The guidelines for Part 3 contain more information on first aid requirements, such as contents of first aid kits, types of first aid attendants, and facilities.

Employers must maintain records of all workplace injuries and diseases.

Note: Personal medical information becomes confidential once names are attached.

Hazard ratings

Hazard ratings (low, moderate, and high risk) developed by WorkSafeBC are used to determine first aid requirements. Generating stations and transmission lines are normally classified as moderate-risk workplaces. However, during construction work for generating-station maintenance (for example, equipment upgrades or major maintenance overhauls), the hazard rating is high. Forestry or arborist work for generating-station maintenance could also increase the hazard rating from moderate to high.

You can find a list of hazard ratings in the first aid supplementary material in the guidelines to Part 3 of the Regulation. Search for “assigned hazard rating” on **worksafebc.com**.

Hospital requirements

The hospital must:

- Be open during your working hours
- Have an emergency department or resuscitation area
- Have a physician on duty or immediately available on call

First aid requirements

Normal operation of a moderate-risk generating station more than 20 minutes surface travel time to hospital

Number of workers per shift	Supplies, equipment, and facility	Level of first aid certificate for attendant	Transportation
1	• Personal first aid kit	N/A	At employer's expense
2–5	• Level 1 first aid kit	Level 1	At employer's expense
6–15	• Level 1 first aid kit • ETV equipment	Level 1 with transportation endorsement	At employer's expense
16–50	• Level 3 first aid kit • Dressing station • ETV equipment	Level 3	ETV

ETV = emergency transportation vehicle

Transportation of injured workers

As an employer, you're responsible for the cost of transporting injured workers from the workplace to the nearest source of medical treatment. Your operation must have posted written procedures for transporting injured workers. These procedures should include the following:

- Who to call for transportation
- How to call for transportation
- Prearranged routes in and out of the workplace and to the hospital

A level 3 first aid certificate and an emergency transportation vehicle are required in the following cases:

- There is an obstruction, barrier, rough terrain, or other situation (for example, a railway crossing or road closure) that is likely to delay ambulance arrival for more than 20 minutes after dispatch.
- There are areas in the workplace that an ambulance can't access safely.
- Workers at the workplace are required to be trained, equipped, and capable of carrying out a rescue.

B. Health and safety responsibilities – Safe work practices

As an employer, you must ensure there is an emergency response plan for the facility. The plan should be based on specific emergencies that could occur at the facility, with flexibility to adjust as a situation requires.

You must also ensure a risk assessment is conducted for all work areas within the facility to determine what kinds of emergency response may be necessary. An emergency response team should be trained to deal with emergency situations, including evacuations.

In the Regulation

Sections 4.13–4.18, Emergency preparedness and response

Training and instruction

You must ensure workers receive instruction in fire prevention and emergency evacuation procedures that apply to their work areas. This may include training in the use of specialized evacuation equipment. Training and instruction should clearly define response limits for workers who are expected to respond to firefighting and containment duties or other emergencies.

Drills

Hold drills at least once a year to evaluate and ensure the effectiveness of emergency procedures, exits, and evacuation routes. You must keep a record of these drills.

Written rescue and evacuation procedures

Written rescue and evacuation procedures are required for (but not limited to) work:

- At high angles
- In confined spaces or where there is a risk of entrapment
- With hazardous substances
- Underground
- On or over water
- Where workers need physical assistance to be moved

9 Emergency preparedness

Identifying hazards and assessing and controlling the risks is essential for keeping workers safe from injury. Hazards can be identified through observations, inspections, testing, consultation with workers and contractors, and review of injury statistics and incident investigations.

Once you've identified hazards, the next step is to assess the risks associated with them. A risk assessment will help you prioritize hazards so you know which should be dealt with immediately and which can be dealt with later.

When assessing risks, try to determine how likely an incident is and how serious it would be. Once you've identified hazards and assessed the risks, look for ways to control those risks.

Hierarchy of risk control

Some types of controls are more effective than others, although it may not always be practicable to use the more effective solution. Whenever possible, though, controls must be implemented in the following order.

1. Elimination — First, try to eliminate the hazard. For example, automate a process or redesign equipment so workers aren't exposed to the hazard.

2. Substitution — Substitute a less-hazardous process or product. For example, use water-based paint instead of solvent-based paint.

3. Engineering — Engineering controls deal with hazards at the source, by adding safety features to equipment or redesigning a task. Consider safeguards for equipment, such as fixed guardrails, travel-restraint systems, or interlocked guards.

4. Administrative — Administrative controls involve the use of policies, procedures, or warning systems to deal with hazards. For example, beacons, restricted area indicators, or signs and labels warn workers that there is a hazard present.

5. Personal protective equipment — PPE should only be used when it's not possible to reduce risk in any other way. PPE may include arc-flash suits, fire-resistant attire, high-visibility clothing, personal flotation devices, and certified electrically insulated tools.

A combination of controls may be required to achieve the best protection.

Monitoring and reviewing control measures

Evaluate your control measures by asking the following:

- Are the controls available to workers? Are workers using them correctly?
- Are the controls effective?
- Are changes or corrections necessary?
- Is exposure to the hazard eliminated or reduced?

10 Hazard identification and risk control

Safe work procedures

Written safe work procedures provide step-by-step instructions on how to perform tasks safely. Not all tasks require a written safe work procedure. Some safety issues can be addressed through training and orientation.

Written safe work procedures are required for the following:

- Hazardous tasks
- Complicated tasks, so important steps don't get missed
- Frequently performed tasks
- Less-routine tasks, if workers need reminders about the hazards and how to control the risks

What to include in a written safe work procedure

Your safe work procedure should include the following:

- Name or description of task
- Assessed risk level
- Hazards workers may encounter
- Required training
- Required PPE
- Manufacturer documentation and where it can be found
- Additional documentation, if applicable
- Most recent revision date, if applicable

Post safe work procedures at workstations, and use them to train workers. Written safe work procedures must be reviewed and updated periodically as equipment and circumstances change in your workplace.

Young and new workers

Young and new workers require special attention when it comes to training and supervision. They may be at more risk of injury than older, more experienced workers.

A young worker is any worker who is under 25 years of age. A new worker can be any age and includes workers who are:

- New to the workplace or location
- Facing hazards that have changed or developed since they were last at the workplace

All workers need a new orientation when circumstances change or new hazards develop.

Ensure all workers at your worksite are aware of their rights and responsibilities. Encourage them to ask questions during and after training.

Working alone or in isolation means working in an area where workers can't be seen or heard by someone capable of providing timely help. If there are workers who are working alone or in isolation, the employer must identify any hazards, assess the risks, and inform workers about the risks.

In the Regulation
Sections 4.20.1–4.23, Working alone or in isolation

Person-check procedure

In addition to other safe work procedures, you must ensure there is a procedure for checking on employees who are working alone or in isolation. A person-check procedure must include the following:

- A designated person to establish contact and record results
- Designated, suitable time intervals between checks, taking into account the task and work location
- A check at the end of the shift
- A procedure to follow if the employee can't be contacted

Means of communication

If checks can't be done in person, you're responsible for providing a reliable way to communicate with employees who are working alone or in isolation — for example, a phone (landline, cellular, or satellite), radio, or personal electronic alarm.

Providing help

Employers must consider how readily available help is in case of an emergency, injury, or ill health. Consider the following:

- Are other people nearby?
- Will other people capable of providing help be aware of the worker's need?
- Is it reasonable to expect other people to provide help?
- Can someone provide help within a reasonable amount of time?

Having either a person-check system or a means of communication won't necessarily be enough to meet the requirements for working alone or in isolation. A combination of the two is best.

12 Working alone or in isolation

Inspections

Workplace safety inspections help identify hazards so risks can be assessed and controlled. Inspections should be performed:

- On an ongoing, informal basis
- At regular intervals (formal and documented)
- After incidents, including near misses
- When new processes or equipment are introduced

Formal inspections should be conducted by a supervisor, a worker, a union representative (if applicable), and a joint health and safety committee member (or the worker health and safety representative, if applicable).

During inspections, identify unsafe acts or conditions. Are workers following safe work procedures? Perform job-task observations.

After inspections, look for ways to eliminate or minimize risks. Fix serious hazards or unsafe work practices immediately. Deal with other hazards as soon as possible.

Incident investigations

Employers are required to investigate and document incidents that involve the following:

- Serious injury to or death of a worker
- Injury requiring medical treatment beyond first aid
- Minor injury or no injury but had potential for causing serious injury
- A major structural failure or collapse of a building, bridge, tower, crane, hoist, temporary construction support system, or excavation
- A major release of a hazardous substance
- Fire or explosion with potential for serious injury
- A diving incident, as defined by the Regulation
- A dangerous incident involving explosive materials
- A blasting incident causing injury

The RCMP or local police generally investigate motor vehicle accidents that occur on public streets or highways. Employers are not required to investigate these.

Records

Employers are required to maintain health and safety records, training checklists, safety meeting minutes, first aid reports (which may be confidential), and incident investigations. Written records can help:

- Identify unsafe conditions or work practices
- Provide material for education and training
- Support investigations and due diligence efforts

13 Inspections — Investigations — Records

When hazardous products are in your workplace, your health and safety program must meet the requirements of the Workplace Hazardous Materials Information System (WHMIS). The system uses consistent labelling to help workers identify, handle, store, and dispose of hazardous products safely.

WHMIS divides products into two hazard groups: physical hazards and health hazards. The two groups are further divided into classes and categories, which use pictograms to identify specific hazards.

In the Regulation

Sections 5.3–5.19, Workplace Hazardous Materials Information System (WHMIS)

Education and training programs

Workers have the right to know the hazards of all products used in the workplace. Employers are responsible for providing training and education in WHMIS 2015.

Labels and safety data sheets (SDSs)

WHMIS labels must include product information in a specific order, using standardized wording that identifies the product, potential hazards, and precautions to be taken. Product suppliers should supply SDSs for their products. Employers must ensure that SDSs are updated regularly and kept in an easily accessible location for emergency use.

Hazardous materials

Generating stations may have hazardous materials on site, such as lubricants, oils, fuels, cleaning agents, solvents, paints, or electrolyte fluids in batteries. Large volumes of lubricants and insulating oils may be contained in turbine generators, auxiliary systems, or transformers. Develop an exposure control plan for these lubricants and oils before major maintenance work in case of spills or exposures. For information on exposure limits, see specific product SDSs.

Handling fuels and oils

Where diesel-fired backup generators are used, there must be proper hoses, nozzles, and dispensing pumps for fuel transfer.

Transportation of dangerous goods

Transport Canada develops safety standards and regulations for handling and transportation of dangerous goods. Workers who transport dangerous goods must be trained in the requirements of the *Transportation of Dangerous Goods Act.*

Fire department notification

Local fire departments should be made aware of storage locations and quantities of hazardous products (for example, explosives, pesticides, radioactive material, or hazardous wastes) when there are quantities that may endanger first responders.

A typical vegetation management program includes planning, scheduling, and inspection before work begins. A utility arborist must be able to identify the voltage levels of any power conductors or circuits. This includes neutral, open-wire-secondary, close-wire-secondary, tree-wire, telephone-cable, and street-light circuits. The utility arborist should also look for hazards, such as broken cross arms, broken insulators, or fallen conductors.

In the Regulation:

- Sections 19.30–19.35, Tree pruning and falling near energized conductors
- Guideline G19.27, Specially trained

Limits of approach for tree pruning and falling

The limits of approach are the minimum distances workers must keep away from exposed energized conductors to be safe. Before work takes place, a qualified person must inspect the worksite to identify hazards, including situations where any part of a tree is within the general limits of approach or could fall within that distance. The owner of the power system must authorize the person doing the inspection and ensure that person is qualified.

If tree pruning or falling will come within the general limits of approach, workers must be authorized by the owner of the power system to do the work. Normally, the only people authorized to do this work are qualified electrical workers (typically transmission line technicians), certified utility arborists, or apprentice utility arborists working under the direct supervision of a certified utility arborist or qualified electrical worker. Table 19-3 in the Regulation specifies the limits of approach for utility arborists.

Tree pruning or falling isn't allowed within the general limits of approach unless both of the following are true:

- A certified utility arborist or qualified electrical worker is present at the site and directing the work.
- At least one additional qualified person trained in appropriate emergency rescue is present.

For more information on training and certification requirements, see guideline G19.27 in the Regulation.

Emergency rescue

Workers who respond to emergencies close to energized high-voltage equipment or conductors need to know about high-voltage hazards and safe work procedures. Emergency rescue workers must be able to provide an approved course certificate for WorkSafeBC officers to inspect. The course certificate can be from any agency acceptable to WorkSafeBC.

Mobile equipment

Employers must ensure that operators of all-terrain vehicles (ATVs) and snow machines are trained to use them and that they follow the instructions in the operator's manual. Training must include the following:

- Pre-trip inspections
- Use of appropriate PPE
- Operating skills based on the manufacturer's instructions
- Basic mechanical requirements of the machine
- Safe loading and unloading of the machine
- Safe use of winches, as outlined by the manufacturer

Before using an ATV or snow machine, the operator must demonstrate competency to a qualified supervisor or instructor.

In the Regulation

Part 16, Mobile equipment

Wildlife

Wildlife can be a serious threat and should be included in hazard assessments. Employers must ensure that workers are trained in safe work procedures for dealing with wildlife.

Cougars

Act aggressively to make a cougar back off. Make yourself big, maintain eye contact, throw things, and shout.

Rattlesnakes

Walk away slowly. If a rattlesnake bites, stay calm. Wash the wound, immobilize the limb, and seek medical help as soon as possible.

Bears

Be prepared with bear mace or spray. If you encounter a bear, stay calm and use a low voice. Make yourself big. Don't stare at the bear.

The following can help reduce your risk of encountering a bear:

- Don't carry food, including commercially packaged snacks. Keep food odours and scented products off your clothes.
- In areas of high bear activity, avoid working alone. Having other people around reduces the risk of an attack.
- Look for bear signs. Leave the area as soon as possible if you observe tracks, droppings, fresh diggings, crushed vegetation, recently overturned rocks or logs, or rotted wood that has been clawed or bitten.
- If you see a bear in the distance, reduce the chance of surprising it by making a wide detour or leaving the area. Make noise to alert bears of your presence.

Other potentially hazardous wildlife includes moose, deer, elk, bighorn sheep, wolves, wolverines, coyotes, and insects (ticks in particular).

C. Safe work practices

Employers are required to have a fall protection system in place if workers are working at heights of 3 m (10 ft.) or more, or where a fall from a lesser height could result in serious injury. Employers must assess the potential hazards involved in any work at heights and ensure that workers use appropriate fall protection.

In the Regulation
Part 11, Fall protection

1. Guardrails

Properly constructed guardrails are generally the best type of fall protection. Once installed, they protect all workers on that work surface.

Guardrails are a practical control on elevated ramps, walkways, and catwalks where permanent access is provided by stairs or fixed ladders. If guardrails aren't practical, the next best available option is a fall-restraint system.

2. Fall restraint

Fall-restraint systems prevent workers from falling by restraining their travel so they can't get close to an unguarded edge. Typically, the worker wears a safety belt or harness connected to a lanyard or lifeline tied to a safe anchorage point. The worker adjusts the lanyard or lifeline to a length that will prevent movement to the open or unguarded edge.

Personal fall-restraint systems are practical when accessing de-energized transformers for testing or in situations where a section of guardrail has to be removed to facilitate work.

For electrical workers climbing or working from a wood pole, the restraint device must meet the requirements of *CSA Standard Z259.14-12, Fall Restrict Equipment for Wood Pole Climbing.*

If guardrails and fall-restraint systems are not practical, the next level of fall protection to consider is fall arrest.

3. Fall arrest

Fall-arrest systems are designed to catch falling workers before they strike the surface below. They consist of fall-arrest harnesses, shock-absorbing lanyards, and lifelines connected to a substantial point of anchorage.

Fall-arrest systems are most practical when a worker is on a narrow work surface or the edge of a structure and is required to reach beyond the safe work area. Fall-arrest systems may be appropriate when working in or on wind-turbine generator nacelles or accessing areas near the water's edge at hydroelectric facilities.

Note: Only full-body harnesses are allowed for fall-arrest systems.

Personal fall-restraint and fall-arrest systems are not practical when anchor points of sufficient rated capacity are not available. The final means of protecting workers against falling is to minimize the risk by using work procedures.

4. Work procedures

Work procedures can only be used as a method of fall protection when other conventional means are not practical. In some cases, they may be used in combination with other forms of fall protection.

Work procedures include a work plan and instruction, training, and supervision of workers. Work procedures must take into account the type of work being performed, environmental conditions, hazards, worker experience, and the length of time the task will take.

An example of work procedures being used in place of conventional fall protection systems is light-duty work on ladders, such as small painting jobs while standing on an extension ladder.

Note: For more information on fall-restraint and fall-arrest systems, see the WorkSafeBC publication *An Introduction to Personal Fall Protection Equipment.* You can also find other information on fall protection requirements in the guidelines that accompany the Regulation.

Anchors and anchorages

An anchor is the component that connects a fall protection system to an anchorage. An anchorage is the secure connection point on a building, structure, tree, or rock. Part 11 of the Regulation describes requirements for the design, use, and maintenance of anchors and anchorages.

Permanently installed anchorages must be certified by a professional engineer.

Working at heights of 7.5 m (25 ft.) or more

A written fall protection plan is required for work at heights of 7.5 m (25 ft.) or more, unless the location has permanent guardrails. The plan should identify the following:

- Fall hazards expected
- Fall protection systems to be used
- Procedures for the use and care of the fall protection systems
- Inspection requirements for the anchors and anchorage points, including rejection criteria
- Procedures for rescuing a fallen worker who is suspended by a personal fall protection system and unable to self-rescue

Rescue and evacuation

In certain locations, such as wind generating stations, high-angle rescue capabilities may be required. Employers may choose to use an industrial high-angle rope rescue provider or implement their own high-angle rope rescue program.

Even where a fall protection plan isn't required by the Regulation, employers must consider the need for rescue or evacuation, as specified in section 4.13 of the Regulation.

18 Fall protection (cont'd)

A confined space is an enclosed or partially enclosed area that's big enough for a worker to enter. The space may be enclosed on all sides or as few as two sides. Confined spaces are not designed for someone to work in regularly, but occasional entry may be necessary for inspection, cleaning, maintenance, or repairs.

Examples of confined spaces include valve pits, turbine pits, penstocks, tailraces, and electrical vaults. Wind-turbine nacelles should be assessed as confined spaces because they're not designed for human occupancy.

Confined spaces can be hazardous to enter. For example, the space may lack oxygen or contain toxic gases or an explosive atmosphere.

Workers must not be allowed to enter confined spaces unless proper training, equipment, and procedures are in place. Workers are considered to have entered a confined space just by reaching into or putting their heads into the opening. If the confined space contains toxic gases, even workers near the opening may be at risk of injury or death.

In the Regulation

Part 9, Confined spaces

Five basic steps for confined spaces

1. Identify the confined spaces on your worksite.
2. Post warning signs and secure entry to confined spaces.
3. Determine the hazards for each space.
4. Educate your workers about confined spaces.
5. Determine which spaces need to be entered.

Note: Confined spaces can be extremely dangerous. Dealing with them safely is a complex process. If it's necessary to enter a confined space on your worksite, you will almost certainly need to get help from a qualified person. If you're identifying confined spaces, even though it's not a requirement you should also hire a qualified person to help you.

Get help from a qualified person

A qualified person is someone who has training and experience in recognizing, assessing, and controlling the hazards of confined spaces. A qualified person is required for the following:

- Determining the hazards for each confined space
- Developing safe work procedures before workers enter confined spaces
- Testing the atmosphere in a confined space

If confined space rescue procedures require entry to the confined space to extract another worker, a qualified person must also help develop these procedures.

Confined space hazard assessments

A hazard assessment must be conducted by a qualified person for each confined space or each group of confined spaces with similar characteristics. The hazard assessment must consider the following for each confined space:

- Conditions that may exist in the space before entry as a result of the space's design, location, and use
- Conditions that may develop during work inside the space
- The potential for oxygen enrichment or deficiency, flammable gases, vapours or mists, combustible dust, other hazardous atmospheres, or harmful substances that require lockout and isolation
- The potential for engulfment, entrapment, and other hazardous conditions

Water passageways

When isolating water passageways at hydroelectric facilities, it's often impossible to apply a double block and bleed isolation system. Employers can have professional engineers certify that certain isolating devices (for example, head gates or turbine inlet valves) can be used as a single point of isolation in a confined space entry plan.

Engineering certifications

Engineering certifications need to address worker safety. They should consider the following:

- Amount of leakage
- Age of the facility or equipment
- Maintenance history of the equipment
- Any other means in place that make the confined space safe to work in

Certifications should be site specific and time limited. Engineers need to determine the applicable time period as part of the certification process.

For more information on confined spaces, see the WorkSafeBC publication *Hazards of Confined Spaces.*

20 Confined spaces (cont'd)

Marine craft certifications

Marine craft are certified under the *Canada Shipping Act*. All commercial vessels must have a certified master on board. Operators of marine craft used for worker transport usually have completed the following training.

Small vessel operator proficiency (SVOP) training

For operators of commercial vessels in coastal or sheltered waters. Topics include stability, collision regulations, shipboard safety, the Canadian buoyage system, radar, and the use of marine charts.

Small non-pleasure vessel basic safety training (MED A3)

For crew members of small non-pleasure vessels (less than 150 gross tons) near coastal and sheltered waters. Provides a basic understanding of hazards associated with marine environments and the vessel. Topics include marine hazards, emergencies, marine firefighting and abandonment, and survival and rescue.

In the Regulation

Sections 17.15–17.26, Marine craft

Vessels used to transport workers

Marine craft used to transport workers must meet generally accepted standards for safety and capacity based on use and expected operational conditions. Craft must be equipped with effective two-way communication that is maintained in good condition and suitable for emergency contact.

Before transporting workers, operators must consider the following:

- Stowage and securing of all cargo, equipment, fuel containers, and supplies
- Ballasting of the vessel
- Existing and forecast weather conditions

Working in or near water

Safe work procedures for cold and swift water should be developed to prevent worker exposure and immersion. Personal flotation devices (PFDs) or lifejackets are recommended. Fall-arrest or fall-restraint systems can be used in areas close to cold-water streams and hydroelectric facility intakes.

In the Regulation

Section 8.26, When required (buoyancy equipment)

Swift water

Swift water exists at all hydroelectric facilities, either at the intake or where the tailrace discharges to the stream. Invisible hazards in swift water can trap people under water. These hazards include submerged in-stream obstructions, penstock debris grates, and turbulence at tailraces. Swift-water rescue requires specialized training. If workers need to work in or near swift water, employers must ensure they're aware of the hazards and help is available in case a rescue is necessary.

Weather and environmental hazards include the following:

- Fog, rain, and snow can reduce visibility and muffle sound.
- Wind can bring down trees or dislodge other overhead hazards.
- Unstable terrain can quickly affect access to work areas.
- Lightning can take down trees and cause fires, electrocution, and equipment damage

If lightning is a risk, take cover in a safe shelter, such as a building, hardtop vehicle, or thick canopy of immature trees. Stay clear of water and metal objects. Turn off radios and communication equipment.

Avalanches

If there is an avalanche risk, a qualified person must conduct an avalanche risk assessment and develop a safety plan. Considerations include topography, vegetation, snow conditions, the history of the area, the type and duration of work, and the structures present. Employers must have a copy of the safety plan readily available at each workplace and provide workers with information and training in safe work procedures. You're also responsible for ensuring the safety plan is reviewed periodically and changed to reflect current conditions.

Avalanche risk assessments are not required when performing emergency work until it has been determined that a worker may be exposed to an avalanche-associated

risk, such as stranding. Repair or replacement of damaged infrastructure or equipment isn't considered an emergency.

In the Regulation

Sections 4.1.1–4.1.2, Avalanche risk assessment and safety plan

Cold and heat stress

Working in cold and hot environments can cause core body temperatures to fall below or rise above normal levels, which range from 36°C (96.8°F) to 38°C (100°F). Workers are at increased risk of hypothermia and cold-related injuries when working at temperatures below –7°C (19°F), on or near bodies of water, bare handed, or in contact with metal surfaces.

If workers may be exposed to cold or heat stress, the employer must conduct an appropriate stress assessment to determine the potential for hazardous exposure. You must also develop and implement an exposure control plan that includes the following:

- A statement of purpose and responsibilities
- Hazard identification and risk assessment and control
- Education and training
- Written safe work procedures and health monitoring
- Documentation, when required

In the Regulation

Sections 7.26–7.38, Thermal exposure

Hot work

Some maintenance and repair work requires hot work, such as welding, torching, cutting, grinding, and using "tiger torches." Qualified workers should perform all hot work according to the requirements of *CSA Standard W117.2-12, Safety in Welding, Cutting, and Allied Processes*.

Workers doing welding or burning work must also wear the following PPE:

- Flame-resistant work clothing
- Gauntlet gloves (leather or other suitable material) and arm protection
- An apron (leather or other suitable material) for heavy work
- Eye and face protection against harmful radiation, particles of molten metal, and while chipping and grinding welds
- Safety footwear (leather or other suitable material)

Fixed workstations must have local exhaust ventilation to minimize worker exposure to harmful air contaminants produced by welding, burning, and soldering. An exposure control plan must be developed and followed for the hazards.

If natural, mechanical, or local exhaust ventilation isn't effective or practicable for short-duration or emergency work, workers must be provided with and wear suitable respirators with appropriate cartridges. Workers must be clean shaven and fit tested for their respirators.

In the Regulation

- Sections 4.70–4.80, Indoor air quality
- Sections 5.48–5.59, Controlling exposure
- Sections 12.112–12.126, Welding, cutting and allied processes

Wind turbines

Wind-turbine generators may present significant fall hazards, especially if the work requires access to the outside of the wind nacelle or tower. Because this work is higher than 7.5 m (25 ft.), a fall protection plan is required.

High-angle rescue may be necessary to remove injured workers from inside nacelles or towers. High-angle rescue is required if:

- Injured workers are in a position that can't be reached by a stairway or elevator
- Workers on stretchers can't be reached by an ambulance crew without specialized equipment and technique

Employers must provide high-angle rescue services if the wind-generating station is outside a jurisdiction that has municipal fire and rescue services with these capabilities. If employers choose to develop their own high-angle rescue capabilities, they will require specialized equipment, training, practice, and documentation.

In the Regulation

Part 11, Fall protection

Warning signs and tags

Clearly visible signs saying “Danger — Energized Equipment” must be placed close to high- and low-voltage equipment and must be visible to workers. They must be posted before completing installation and after energizing electrical equipment. These signs are often posted on substation fences and doors to areas where electrical equipment is installed.

Clearly visible warning signs must also be posted on entrances to rooms and other guarded locations containing uninsulated, exposed, energized parts or equipment. These signs must limit entry to qualified and authorized persons.

Barricades and barriers

If uninsulated, energized low-voltage parts (31 V to 750 V) are not guarded with approved cabinets or enclosures, there must be a barrier or cover if workers who are unfamiliar with the hazards are working within 1 m (3.3 ft.). Barriers or distinctive identification must be used to differentiate high-voltage equipment that has been de-energized for safety reasons from similar energized equipment if lack of such identification could pose a risk to workers.

Hazard areas

A hazard area is an area where work activities could result in the transmission or release of energy that could be dangerous to workers. Access to hazard areas must be limited to authorized workers through entry points identified with appropriate signs or barriers. Warning signs indicating “Authorized Personnel Only” should be posted within sightlines around the perimeter of the hazard area.

Entry point signs should display:

- Information about potential hazards in the area
- The name of the worker responsible for work inside the area

Workers should stay in safe work areas at all times unless they’re authorized to enter a hazard area.

Proximity barriers

Proximity barriers made of dielectric material are used when workers need to work within the limits of approach. Barriers used for equipment protection should be fitted with a decal that states “Not for Personal Protection — Equipment Protection Only.” Proximity barriers must be erected and secured in place using live-line tools or protective gloves suitable for the task. Barriers used to prevent contact with equipment must be field inspected regularly but don’t need to be electrically tested.

D. Safe work practices

What is lockout?

Lockout is the use of a lock or locks to render machinery or equipment inoperable or to isolate an energy source. The purpose of lockout is to prevent an energy-isolating device (such as a valve, circuit breaker, or switch) from accidentally or inadvertently being operated while workers are performing maintenance on machinery or equipment.

A tagout system alone doesn't meet the minimum standard of lockout and isn't enough to guarantee worker safety. Employers must ensure that a lockout procedure is in place and that workers follow it.

In the Regulation

Part 10, De-energization and lockout

Five steps for locking out

If lockout is required, follow the five steps listed below. They apply to lockout for all types of machinery and equipment. Every worker must know these steps.

1. Identify the machinery or equipment that needs to be locked out.
2. Shut down the machinery or equipment. Make sure all moving parts have come to a complete stop. Ensure that the act of shutting off equipment doesn't cause a hazard to other workers. Bleed stored energy, such as air, hydraulics, or electricity (through bonding).
3. De-activate the main energy-isolating device for each energy source. Open circuit breakers or main disconnect switches and other energy-isolating devices. Lock them in the open position.
4. Apply a personal lock to the energy-isolating device for each energy source. Ensure all parts and attachments are secured against inadvertent movement. Tag and label the lockout device.
5. Ensure all workers are clear and no hazard will be created if the lockout is ineffective. Then, test the equipment to verify each energy source is isolated and effective.

Personal locks

Typically, workers use an individually keyed lock to secure energy-isolating devices. Every worker who is required to lock out machinery or equipment needs a personal, uniquely identifiable lock and is responsible for keeping the key to that lock. During lockout, the key must be kept in a secure location or on the person who performed the lockout. Duplicate keys must be stowed in a secure location under the control of a supervisor or manager in charge.

Once a worker has placed a personal lock on an energy-isolating device, only that worker (or a supervisor) can remove it. If more than one worker is working on the equipment, each worker must place a personal lock on the energy-isolating device.

Note: Combination locks must not be used for lockout.

Group lockout

Group lockout reduces the number of locks required and saves time. A written group lockout procedure must be developed and clearly posted where group lockout is used.

In a group lockout procedure, instead of each worker putting a personal lock on each energy-isolating device, two qualified workers lock the devices. Their keys are then placed in a key-securing system — for example, a box that can be locked or one that has an approved positive-sealing device that can't be tampered with.

The two qualified workers are responsible for the following:

- Independently lock out the energy-isolating devices.
- Secure the keys for the personal locks that were used. Each of the qualified workers applies a personal lock on the key-securing system or uses another approved positive-sealing device.
- Complete, sign, and post a checklist that identifies the machinery or equipment components covered by the group lockout.

Requirements for high-voltage power systems

High-voltage equipment must be completely isolated, grounded, and locked out before work begins. If it's impracticable to completely isolate the equipment, workers must follow safe work procedures acceptable to WorkSafeBC.

Two or more qualified and authorized people must be present during the work, unless the procedures specifically permit the work to be done by one person. Appropriate protective equipment and live-line tools must be selected, used, and maintained in accordance with a standard acceptable to WorkSafeBC.

Safe work procedures must also be followed for the use of metal ladders, wire-reinforced side-rail wooden ladders, metal scaffolds, or metal work platforms.

A safety protection guarantee is an assurance that a power system or part of the power system is isolated and will remain isolated. The power system owner can only assign one person at a time (the person in charge) to issue safety protection guarantees. In addition, only workers authorized by the power system owner may receive safety protection guarantees or work on the power system. The PIC must keep a log of all issued safety protection guarantees.

Requirements for issuing safety protection guarantees

The following steps must be taken before a PIC can issue a safety protection guarantee to workers:

- Isolate or disconnect the equipment or system from the energy source.
- Apply grounding, bonding, or blocking and test to verify de-energization.
- Apply locking devices and tags to each isolation point to ensure energy isn't restored before work is completed.
- Use barriers or distinctive identification to differentiate high-voltage electrical equipment that has been de-energized for safety reasons from similar energized equipment at the work location (if a lack of such identification would result in undue risk to workers).

Once a safety protection guarantee is in effect, the equipment to be worked on must be tested to verify it has been isolated before grounding and blocking begins.

Requirements for energy-isolating devices

Energy-isolating devices used for safety protection guarantees must meet the following requirements:

- Allow for visual verification that the isolation point is open
- Be lockable and locked before work starts, in the position or condition required to protect workers
- Have a securely placed, distinctive "Do not operate" tag

The best way to protect against the hazards of high-voltage electrical energy is to observe the limits of approach for exposed energized conductors, such as wires, transformers, and other components that conduct electricity. The limits of approach depend on the voltage of the energized conductors. Unqualified workers must stay outside the limits of approach specified in table 19-1A of the Regulation.

When working with tools or equipment, consider their reach. The minimum approach distance should be measured from the outside edge of any tools, mobile equipment, or materials being used. The risk of injury increases the closer a worker or piece of equipment gets to an energized conductor.

Employer responsibilities for limits of approach

Employers must determine the voltage of any exposed energized conductors, which will dictate the limits of approach. Employers are responsible for ensuring the following:

- Before starting work, supervisors and workers know the locations of all electrical power sources in the area that are exposed or might become exposed.
- Workers have received instruction in the safe work procedures they must follow.
- Supervisors review the limits of approach with workers who work near exposed, energized high-voltage equipment or transmission lines.
- Supervisors hold and document pre-job safety meetings.

Adjusted limits of approach

Table 19-2 in the Regulation specifies adjusted limits of approach for specially trained workers.

When authorized by the owner of the power system and using work procedures acceptable to WorkSafeBC, qualified workers and workers under their direct supervision may work within the minimum distances specified in tables 19-1A and 19-2.

In the Regulation

- Part 10, De-energization and lockout
- Part 19, Electrical safety
- Part 19, Tables 19-1A, 19-1B, and 19-2

Bonding and grounding

High-voltage lines and equipment must be considered energized until isolated, locked out, and grounded. Minimum limits of approach apply until protective grounds are applied to transmission lines.

Bonding and grounding transmission lines and equipment is a way to ensure that electrical energy is controlled at the worksite. Bonding and grounding prevents accidental re-energization or induction. This protects workers against electrical shock while working on de-energized lines or equipment.

The process includes the following:

- Bonding all conductors in the work area together with flexible copper leads
- Connecting the bonded conductors to ground

Equipotential zones

Equipotential zones are areas in which all conductive materials remain at the same potential because properly applied bonding eliminates the difference in voltage between conductors. Connecting the bonded conductors to ground ensures that:

- All conductors remain near ground potential
- Any electrical charge is quickly dissipated
- Any energization from an electrical fault helps trip protection devices (circuit breakers or fuses) to stop the current flow

Assurances

There may be situations in which the limits of approach are accidentally violated. For example, inadvertent movement by a worker or piece of equipment may accidentally breach the limits of approach. Or, work may be in progress near de-energized equipment when the equipment is prematurely re-energized.

Before re-energizing the system, assurances must be made that work being done inside the limits of approach has been safely moved to outside the limits. Employers should contact the power system owner to coordinate any work inside the limits of approach.

Power system owners should have a system in place for work being done inside the limits of approach and work that could inadvertently violate those limits. Such a system may include the following:

- Worksite meetings to decide on displacement or rerouting, de-energizing (isolating and grounding), or visually identifying and effectively guarding
- Assurance in writing indicating the option taken and when
- Worker training on appropriate safe work procedures, which may be unique to your power system

Owners of power systems must issue written assurances to employers doing work near power sources. Assurances should state that reclose features on the transmission lines adjacent to the work have been disabled.

Switching

If a switching sequence requires the operation of three or more devices, a written switching order must be prepared and executed by qualified workers only before undertaking the switching operation. The PIC is responsible for keeping a record of switching details. On smaller power systems (for example, where the PIC is based at the generating station), the PIC often prepares and executes switching orders.

Mimic displays

PICs use mimic displays to plan and implement safety protection guarantees. Mimic displays show the current configuration and status of each device in the system.

A mimic display can be one of the following:

- An electronic display in the control room.
- An operating one-line diagram that shows each electrical device represented by a symbol, together with its unique identifying number or designation.
- A unit-isolation diagram used in a generating station to isolate individual units or subsystems. It shows sources of hazardous energy, pipes and electrical conductors, and the energy-isolating devices used to isolate the generating unit represented.

To prevent confusion about the current status of the power system, workers must only use one mimic display at a time. PICs must ensure that the status of their assigned part of the power system is accurately represented.

Testing and verification

After the PIC has issued a safety protection guarantee, the equipment to be worked on must be tested to verify isolation before grounding and blocking begins. A qualified electrical worker should apply grounds as close to the worksite as possible.

After testing, the person responsible for each work crew must verify that the required grounding and blocking devices are in place before any work begins. Grounding and blocking devices may be removed to conduct tests.

Equipment used for electrical testing must meet the requirements of one of the following:

- *CSA Standard C22.2 No. 160-15, Voltage and Polarity Testers*
- *CSA Standard CAN/CSA-C22.2 No. 231 Series-M89 (2001), CSA Safety Requirements for Electrical and Electronic Measuring and Test Equipment*

Testing equipment that doesn't meet these CSA standards may only be used if it meets the requirements of section 19.8(2) of the Regulation.

Tool care and maintenance

Workers use insulated or dielectric tools to work on and repair high-voltage systems. For example, workers use hot sticks and rubber gloves to verify isolation and apply grounds. These tools must be cared for and maintained to ensure their electrically insulating properties. The tools often require regular testing and certifications by third-party vendors.

Insulated and dielectric tools must be stored, tested, and maintained as specified in section 4.3(2) of the Regulation and one of the following standards:

- *ASTM Standards on Electrical Protective Equipment for Workers, 12th Edition*
- *CAN/ULC-60895-04: Live Working — Conductive Clothing for Use at Nominal Voltage up to 800 kV a.c. and ±600 kV d.c.*

Batteries and capacitors

Generating stations have backup systems to provide emergency power when the station loses service power. These systems often use lead-acid batteries because of their low cost, high efficiency, and long life. Lead-acid batteries use diluted sulfuric acid as an electrolyte. This sulfuric acid and other substances that may be in the batteries can be hazardous to workers if the batteries are damaged. Ask the battery manufacturer about safe work procedures before handling batteries installed at your facility.

When batteries are in service, a direct short circuit across the battery cells will cause the release of a large amount of stored energy. This may result in an explosion.

Don't overcharge batteries or charge them with higher voltages than recommended. Doing so may result in battery failure.

Residual energy

Batteries and capacitors store potentially dangerous residual energy long after power has been removed and they have been de-energized. This presents a hazard to workers and connected equipment. Make sure large batteries and high-voltage capacitors have been discharged before work begins. Take special care when isolating high-voltage or line-powered equipment, such as capacitor voltage transformers or current transformers.

Testing and commissioning

Generally, before working on electrical equipment, it's isolated and locked out, a safety protection guarantee is granted, and the equipment is grounded. Occasionally, this may not be practicable — for example, when equipment must be fully or partially energized for testing or commissioning.

If it's impracticable to lock out a part of the power system, the following requirements apply:

- Clearly define the boundaries of the partially energized power system.
- Make sure all major equipment used to establish safety protection guarantees is uniquely identified with clearly visible warning tags on or near the equipment.
- Follow written safe work procedures that address safety protection guarantees and the requirements of Part 19 of the Regulation.

If grounding and blocking equipment is impracticable, the alternative safe work procedures must be acceptable to WorkSafeBC.

Risk assessment rating matrix

Likelihood	Consequences			
	Extreme Death or permanent disability	**Major** Serious bodily injury	**Moderate*** Medical treatment and time away from work may be required	**Minor** First aid, no lost time
Very likely Could happen frequently	1	2	3	4
Likely Could happen occasionally	2	3	4	5
Unlikely Could happen, but rare	3	4	5	6

*Don't underestimate moderate consequences. They could be very important — give them serious consideration.

Score	Rating	Action
1,2,3	High	Do something about this hazard immediately.
4,5	Moderate	Do something about this hazard as soon as possible.
6	Low	This hazard may not need immediate attention. Deal with it when feasible.

Terms

dangerous incident — An accident or near-miss occurrence caused by or as a result of the use of explosives. Also includes an unexpected result or problem with explosive products.

due diligence — Taking all reasonable care to protect the well-being of workers and others at the worksite by identifying hazards, implementing preventive measures, and communicating relevant information to workers.

hazard — A thing or condition that may expose a person to a risk of injury or occupational disease."

high voltage — A potential difference (voltage) of more than 750 V between conductors or between a conductor and ground.

low voltage — A potential difference (voltage) from 31 V to 750 V between conductors or between a conductor and ground.

mimic display — A symbolic representation of all or part of a power system, complete with device designations.

penstock — A sluice, gate, or intake structure that controls water flow, or an enclosed pipe that delivers water to hydroelectric power-generating turbines.

power system — All plants and equipment essential to the generation, transmission, or distribution of electricity, including any plant or equipment that is out of service, being constructed, or being installed.

PPE — personal protective equipment

qualified — Being knowledgeable of the work, the hazards involved and the means to control the hazards, by reason of education, training, experience or a combination thereof.

qualified electrical worker — A person who meets the requirements of the Electrical Safety Regulation for installing, altering, or maintaining electrical equipment.

swift water — Water moving faster than 1 knot (1.85 km/hr), as defined by National Fire Protection Association Standard 1670.

switching — The operation of one or more electrical devices (e.g., circuit breakers, cutouts, disconnecting/isolating switches, or interrupter switches) to isolate, de-energize, or energize electrical equipment or electric circuits.

tailrace — A channel that returns water from a hydroelectric power-generating station back to the stream after it has rotated the turbine.

About this publication

This publication is meant to help owners, employers, and workers understand the health and safety requirements related to power production in British Columbia. You may also find some of the information in this publication useful if you're a prime contractor, supplier, or supervisor.

This publication doesn't replace the *Workers Compensation Act* or the Occupational Health and Safety Regulation. It's not intended to explain all the health and safety requirements that apply to power production in B.C. Owners, employers, contractors, and supervisors should always refer to the Act, the Regulation, and applicable guidelines for specific requirements that apply to their operations and work activities.

Throughout this publication key sections of the Act and the Regulation are indicated by the headings "In the Act" and "In the Regulation." For more information, visit worksafebc.com.

This publication was developed by WorkSafeBC and Clean Energy BC (CEBC). CEBC's goal is to develop a viable power generation and power management industry in B.C. that serves the public interest by providing cost-effective electricity through the efficient and environmentally responsible development of the province's generation and transmission resources and facilities.

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